Third contribution to the knowledge of the South African species of the genus *Ceramius* Latreille (Hymenoptera: Masaridae)

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INTRODUCTION

The South African species of the genus *Ceramius* Latreille are fairly well known, at least from a taxonomic aspect, having in recent years been studied by Richards (1962) and by Gess (1965 and 1968). Nevertheless, *Ceramius* material in the Albany Museum, in the private collection of Mr. H. N. Empey and in the collections made in South Africa by Dr. J. Rozen (1966 and 1968) and by Dr. and Mrs. H. Townes (1970), combined with continued collecting and field observations by the author and by Mr. J. G. H. Londt, has brought to light some interesting additional information.

In the present paper the hitherto unknown male of the very rare species *C. rex* de Saussure is described, *C. schulthessi* Brauns is sunk into synonymy with *C. cerceriformis* de Saussure, and additional locality records of several other species are listed. A table listing flowers visited by *Ceramius* species in South Africa shows a five-fold increase in the number of observed wasp-forage flower associations, the preferred flowers belonging to the Mesembryanthemaceae and Compositae. Also resulting from field observations are descriptions of the nesting sites and nest superstructures of *C. lichtensteinii* (Klug) and *C. capicola* Brauns, and the identification of a hitherto unrecorded parasite. A key restricted to the South African species of the genus but incorporating recent changes and additions is given.

DESCRIPTION, SYNONYMY AND DISTRIBUTION RECORDS

Ceramius rex de Saussure

Ceramius rex de Saussure, 1855:75, ♀; Turner, 1935:290; Gess, 1965:225, ♀.
Ceramius lichtensteinii (*non* Klug), Richards, 1962:102.

Described from the Cape Colony without precise locality, this species does not appear to have been collected again until over eighty years later when a single specimen believed to be conspecific was obtained in Namaqualand. This specimen, like the type a female, labelled "Klipvlei, Garies, xi. 1931 (S. A. M. Staff)" was stated by Turner (1935: 290—1) to correspond to the description of *rex* de Saussure, an opinion shared by Gess (1965: 225) who gave a detailed description of the specimen in question.

In an unsuccessful attempt to obtain further specimens, the author collected in the vicinity of Garies during early October, 1966 and again at the same time in 1967. Since then, however, a further specimen has come to hand—collected entirely by chance by Dr. and Mrs. H. Townes at Garies (25.ix.1970). This specimen, a male, clearly conspecific with the Garies female of 1931 and therefore believed to be the long unknown male of *rex*, is described below.

♂. Black; mandibles (except teeth at apex), clypeus, broad spot between antennal sockets and above clypeus (from which it is separated by a narrow black line at suture), a narrow streak on inner margin of eyes below extending as far as centre of ocular sinus, underside of scape and of second antennal segment as well as extreme base of third below, spots behind eyes (not joined along occipital margin), pronotal band produced onto humerus and to tegula (leaving a triangular black area on side), anterior corner of tegula, small streak margining postero-lateral corner of mesoscutum, small spot at apex of scutellum, flap of posttegula, small spots on posterior angles of propodeum, a large spot on mesopleuron, spots on meso-sternum behind adjoining coxae, legs (except for black upper surface of coxae and trochanters and streak on femora, distal parts of third to fifth tarsomeres of middle legs, and to a less extent hind legs, and also pulvilli and claws of all legs), posterior bands widening markedly on sides on gastral tergites 1—6, baso-lateral spots on tergite 7, greater part of sternites 2,4 and 5 and lateral areas of 3,6 and 7, *yellow*.

Antennal flagellum except for black dorsal suffusion on all segments bar the last (which however has a little black basally), and extreme sides of tergite 7 *ferruginous*.

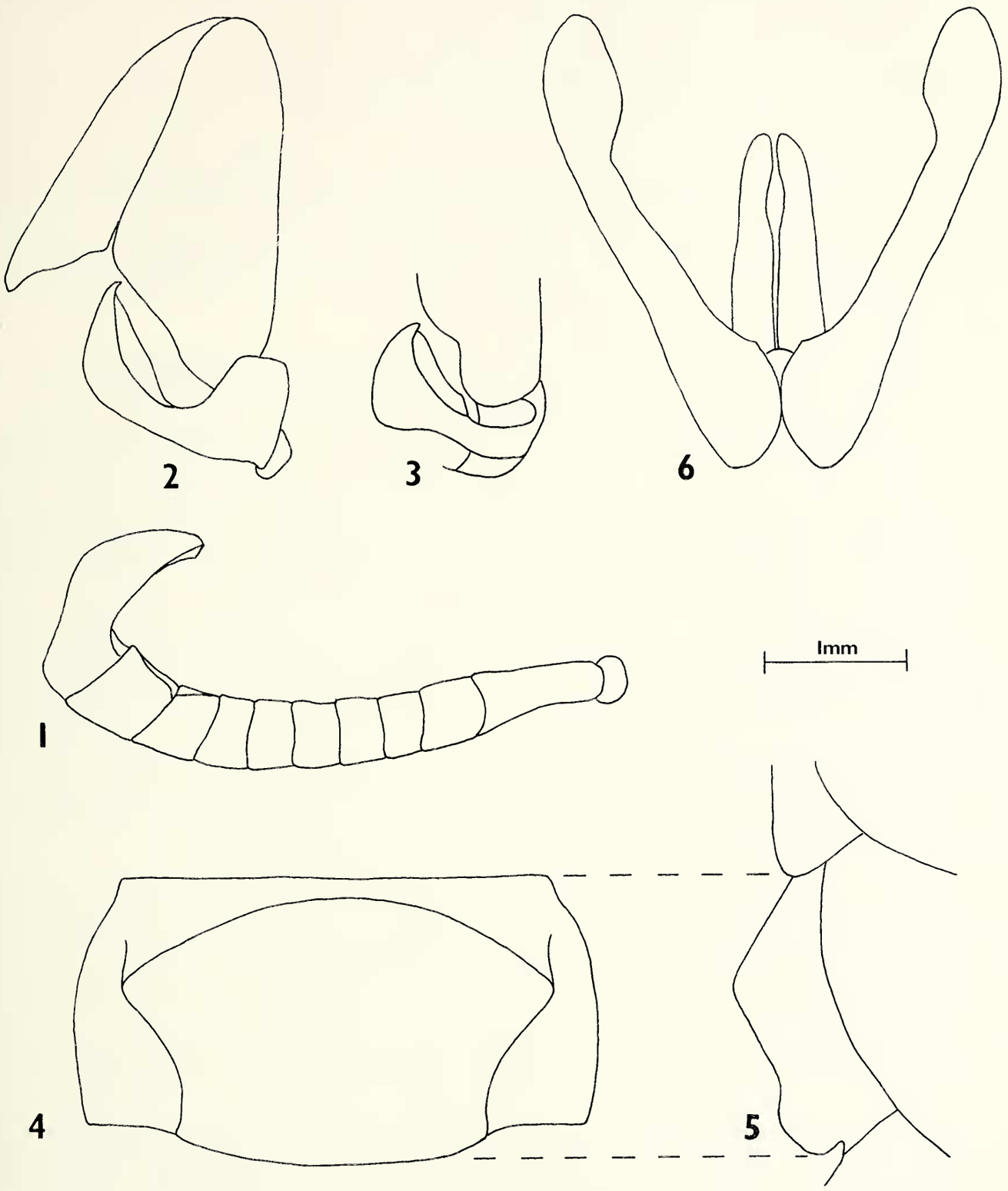
Wings faintly brownish, veins brown, subcosta and median vein almost *black*.

Length about 20 mm, length of fore wing 13 mm, hamuli 24.

Head, thorax, propodeum, first two gastral segments and seventh sternite with fairly sparse, long, whitish hairs; coxae, trochanters and femora posteriorly with similar but shorter hairs; concave portion of disc of sternite 3 with exceedingly dense, short, light ferruginous hairs; rest of gaster with very fine tomentum-like pubescence.

With the exception of the secondary sexual structural characters described below, very like the female in most respects including the structure and proportions of the clypeus, scutellum and acarinarium.

Antennal sockets separated by slightly less than twice their diameter (4,1 times in female); interocular distance at level of sockets one and a third times the length of scape (without radicle) (twice in female). Scape curved, strongly widened, twice as long (without radicle) as greatest width (almost 3 times in female); segment 2 very short, broader than long, largely concealed in end of scape; segment 3 flattened in side view, narrow except at apex, two thirds as long as scape (without radicle) and slightly longer than 4+5+6; 4—11 becoming progressively wider; 12 forming a powerful, long, flattened and fairly wide hook, inwardly curved at both base and apex; segments 8—11 modified beneath (Fig. 1). Fore trochanter (Fig. 2) with a very large, outwardly curved, crescentic lobe whose distal half is more or less



Ceramius rex de Saussure ♂. Fig. 1. Antennal flagellum. Fig. 2. Fore trochanter, femur and tibia. Fig. 4. Sternite 3 (ventral view). Fig. 5. Sternite 3 (profile, from left side). Fig. 6. Genitalia dorsal view).
Ceramius metanotalis Richards ♂. Fig. 3. Fore trochanter and portion of femur.

evenly curved and of even width (in *metanotalis* (Fig. 3) abruptly curved and widened apically). Gaster with tergite 7 elongate, apically widely, very shallowly and angularly emarginate; sternite 3 (Figs. 4 and 5) with disc raised anteriorly and laterally and especially antero-laterally to form a carinate rim of a concave, wider than long, saucer-like depression; sternite 4 unmodified in structure; sternite 7 with a prominence. Genitalia (Fig. 6).

Specimen examined: Cape Province (Namaqualand): Garies, 25.ix.1970 (Dr. and Mrs. H. Townes) Metallotype ♂. (In the Albany Museum collection).

The acarinaria both contain mites, several of which are also present amongst the hairs on the propodeum.

The male of *rex* may readily be distinguished from the males of both *caffer* de Saussure and *metanotalis* Richards, which are the most closely related species, by the much more strikingly modified third sternite; from *caffer* by the absence of preapical lateral keels on sternite 4; and from *metanotalis* by the different shape of the lobe of the fore trochanter.

Ceramius cerceriformis de Saussure

Ceramius cerceriformis de Saussure, 1853: xxi, ♂; Richards, 1962:97, ♂, ♀.
Ceramius (*Ceramioides*) *cerceriformis* de Saussure, 1854: pl. 4, fig. 1, ♂; 1855:72, ♂.
Cerceris vespiformis de Saussure, 1855:79, ♀.
Ceramius schulthessi Brauns, 1902:182, ♀; Brauns, 1913:196, pl. 2, fig. 6, ♂, ♀; Richards, 1962:99; Gess, 1965:220; Gess, 1968: 10, syn.n.

Richards (1962) who examined the types of *cerceriformis*, *vespiformis* and *schulthessi* was "not altogether convinced" that *schulthessi*, which was "scarcely distinguishable" from *cerceriformis*, was distinct from the former, but the females which were compared "seemed to be distinct".

According to Richards' descriptions and his key the only differences between *cerceriformis* and *schulthessi* are in their puncturation and colouring. Thus both sexes of *cerceriformis* have the gaster impunctate while in *schulthessi* it is slightly shining and distinctly though finely punctured, at least on the first two tergites. In the female furthermore, the pronotum and mesonotum are dull with denser punctures in *cerceriformis*; more shiny with coarser, sparcer punctures in *schulthessi*. While sternite 2 is punctured throughout in the former, it is shining with a large almost unpunctured area on each side of the disc in the latter. Their colouration differs in that *cerceriformis* has very extensive, entirely yellow markings, while *schulthessi* is less extensively yellow-marked but has some red areas. The amount of red on gastral tergite 2 and yellow on 3—6 is however very variable.

Two pairs of wasps from Namaqualand (Swart Doringrivier and 6 miles South of Garies), representatives in the Albany Museum collection of longer series in the South African Museum, which were recorded as *C. schulthessi* Brauns (Gess, 1968), appear upon re-examination to fit the descriptions of *cerceriformis* reasonably well. Compared with these specimens, a series from Willowmore, fitting the description of *schulthessi* indicates some further minor differences: in the latter there seems to be a tendency for the disc of the scutellum to be somewhat more clearly margined, while the spine-like projections on the propodeum are generally more developed. However, the degree of development of these spines seems to vary also within a population.

While these small differences in the degree of puncturation, the degree of development of the propodeal spines, and the colouration do certainly exist, the similarity otherwise between *cerceriformis* de Saussure and *schulthessi* Brauns is such that it is impossible to separate the two using any other criteria.

Are these characters of any real value? As has been noted by both Brauns and Richards, the distribution and amount of red and of yellow in *schulthessi* is very variable. The degree of

development of the propodeal spines is similarly variable, the variability in this case being present in both *cerceriformis* and *schulthessi*. It is believed that the remaining point of difference, namely that of the degree of puncturation, will with the examination of more material likewise be found to be variable and of questionable value.

On balance, the small differences in detail, of limited or questionable taxonomic validity, are far outweighed by the striking overall similarities, and there seems little if any justification in maintaining the specific integrity of the two forms on such slender evidence. *C. cerceriformis* de Saussure and *C. schulthessi* Brauns may best be considered as opposite extremes of a single widespread and very variable species; only much more extensive collecting can indicate whether they are sufficiently distinct to be accorded subspecific rank. *C. cerceriformis* de Saussure has priority and *C. schulthessi* Brauns must therefore sink into synonymy.

Ceramius cerceriformis de Saussure
Cape Province: Willowmore, 15.xi.1905 (Dr. Brauns) 4♂♂, 31.x.1967 (C. Jacot-Guillarmod) 9 ♀♀, ♂.

Ceramius richardsi Gess
Cape Province: Citrusdal, 2.xi.1966 (J. G. Rozen) 2 ♀♀.

Ceramius micheneri Gess
Cape Province: Citrusdal, 2.xi.1966 (J. G. Rozen) 2 ♀♀.

Ceramius nigripennis de Saussure
Cape Province: Garies, 23.ix.1970, ♂, 24.ix.1970, 3 ♀♀, ♂, 25.ix.1970, ♂, 27.ix.1970, 11 ♀♀, 8 ♂♂, 28.ix.1970, 4 ♀♀, ♂, 29.ix.1970, 4 ♀♀, ♂ (all Dr. and Mrs. H. Townes).

Ceramius braunsi Turner
Cape Province: Worcester, 16.ix.1972 (R. D. A. Bayliss) ♀.
This new locality is of interest as it to some extent links the previously known distributional areas—the region between Citrusdal and Vanrhynsdorp on the one hand and Willowmore on the other.

Ceramius jacoti Richards
Cape Province: Brandrivier road, 2 miles from junction with Ladismith—Riversdale road, 30.ix.1972 (C. F. Jacot-Guillarmod) 3 ♂♂.

Ceramius beyeri Brauns
Cape Province: Clanwilliam, 2—5.xi.1966 (J. G. Rozen) 2 ♀♀; Grahamstown, Bible Monument, 16.i.1969 (F. W. Gess) ♀; Willowmore, no date (Dr. Brauns) 3 ♀♀.

Ceramius lichtensteinii (Klug)
Cape Province: Alicedale, New Year's Dam, 2.xii.1970 (F. W. Gess) ♂, same date (J. G. H. Londt) 4 ♂♂; Dunbrody, no other data, ♀; Ecca Pass, 22.xi.1964 (D. J. Brothers) ♂; Fort Beaufort, 20.i.1960 (C. Jacot-Guillarmod) ♂; Fort Willshire near Alice, 21.i.1959 (C. Jacot-Guillarmod) ♀, ♂; Grahamstown, Bible Monument, 16.i.1969 (F. W. Gess) ♀; Grahamstown, Clifton, 7.xi.1972 (F. W. and S. K. Gess) 7 ♀♀, ♂, 9.xi.1972 (F. W. and S. K. Gess) 3 ♀♀; Grahamstown, Hilton, 1—4.xii.1970 (F. W. Gess—Malaise Trap) ♀; Grahamstown, Kranzdrif, 5.xi.1967 (C. Jacot-Guillarmod) ♀; Grahamstown, Plutos Vale, 8.xi.1964 (C. Jacot-Guillarmod) ♀; Grahamstown, Strowan, 9.xii.1968, 2 ♀♀, ♂, 11.xii.1968, ♀, 8.i.1969, ♀, 30.xi.1970, ♀, 2 ♂♂ (all F. W. Gess), 20.xii.1970 (C. Jacot-Guillarmod) ♂; 4 miles NE of

Steytlerville, 12.xi.1968 (J. G. Rozen and E. Martinez) ♀, ♂; Thorngrove, 29.i.1960 (L. Naerly) ♀; Victoria West, 10.i.1965 (H. N. Empey) 19 ♀♀, ♂; Waterford, 13.i.1965 (H. N. Empey) 8 ♀♀, ♂; 4 miles E of Waterford, 29.x.1967 (C. Jacot-Guillarmod) ♀; Willowmore, 12.i.1965 (H. N. Empey) ♂.
Orange Free State: Kroonstad, 10.i.1965, 3 ♀♀, 2 ♂♂, 16.i.1965, ♂, 23.i.1965, ♀, 27.i.1965, ♀, xii.1965, ♀, ♂, 31.xii.1965, ♂, 21.xii.1966, ♂ (all D. J. Brothers).

Ceramius bicolor (Thunberg)

Cape Province: Fullarton, Willowmore, 30.x.1967, 6 ♀♀, ♂; near Fullarton, Willowmore, 30.x.1967, ♂; Willowmore, 31.x.1967, ♀ (all C. Jacot-Guillarmod); 18 miles SE of Touwsrivier, 12.xi.1966 (J. G. Rozen) 2 ♀♀.

Ceramius linearis Klug

Cape Province: Alicedale, New Year's Dam, 22.xi.1970 (J. G. H. Londt) 10 ♂♂, 2.xii.1970 (J. G. H. Londt) 4 ♀♀, 4 ♂♂, same date (F. W. Gess) 3 ♀♀, 10 ♂♂, 16.xii.1971 (F. W. Gess) 2 ♀♀, 2 ♂♂; Carlisle Bridge, xii.1971 (R. Bayliss) ♀; Grahamstown, 13.vi.1959 (E. McC. Callan) ♀, 15.xii.1959 (E. McC. Callan) ♀, 12.xi.1960 (E. McC. Callan) ♀, 27.xii.1960 (E. McC. Callan) ♂, 8.xii.1964 (D. J. Brothers) 2 ♂♂, 18.xii.1969 (J. G. H. Londt) ♀; Grahamstown, Belmont Valley, 4.xii.1969 (J. G. H. Londt) ♀, 15.xii.1971 (J. G. H. Londt) ♀, ♂; Grahamstown, Boskey Dell, 24.ix.1967 (C. Jacot-Guillarmod) ♀; Grahamstown, Clifton, 17.x.1972 (F. W. and S. K. Gess) 11 ♀♀, 10 ♂♂, 26.x.1972 (F. W. and S. K. Gess) 24 ♀♀, 46 ♂♂, 27.x.1972 (F. W. and S. K. Gess) 2 ♂♂, 7.xi.1972 (F. W. and S. K. Gess) 8 ♀♀, 10 ♂♂, 9.xi.1972 (F. W. and S. K. Gess) 7 ♀♀, 13 ♂♂; Grahamstown, Hilton, 22.x.1967 (D. J. Brothers) 3 ♂♂, same date (C. Jacot-Guillarmod) ♀, 5.xi.1969 (C. Jacot-Guillarmod) ♂, 2—5.xi.1970, ♀, 5—9.xi.1970, ♀, 12—30.xi.1970, ♀, 3 ♂♂, 1—4.xii.1970, ♀, ♂ (all F. W. Gess—Malaise Trap); Grahamstown, Hounslow, 22.xii.1966 (C. Jacot-Guillarmod) ♀; Grahamstown, Plutos Vale, 8.xi.1964 (C. Jacot-Guillarmod) ♂; Grahamstown, Settlers' Dam, 30.xii.1971 (F. W. Gess) 4 ♀♀, 5 ♂♂; Grahamstown, Vaalvlei (Mosslands), xii.1971 (R. Bayliss) 2 ♂♂; Kenton-on-Sea, 15—30.xi.1970 (R. A. Jubb—Malaise Trap) ♂, 21.xi.1970 (J. G. H. Londt) 2 ♂♂, 1—8.xii.1970 (R. A. Jubb—Malaise Trap) ♀, xii.1971 (R. A. Jubb—Malaise Trap) ♀, i.1972 (R. A. Jubb—Malaise Trap) 2 ♀♀; Tharfield, 1906 (Mrs. G. White) ♂; Victoria West, 10.i.1965 (H. N. Empey)♀; Willowmore, 12 i.1965 (H. N. Empey) ♂.

Ceramius capicola Brauns

Cape Province: Alicedale, New Year's Dam, 2.xii.1970 (F. W. Gess) ♀, 2 ♂♂, same date (J. G. H. Londt) ♀, ♂; Grahamstown, 18.xi.1958 (C. Jacot-Guillarmod) 4 ♂♂, 8.xii.1964 (D. J. Brothers) 4 ♂♂, 7.i.1967 (C. Jacot-Guillarmod) 5 ♀♀; Grahamstown, Belmont Valley, 5.xii.1969 (J. G. H. Londt) ♀, 14—20.xii.1971 (F. W. Gess—Malaise Trap) ♀, 15.xii.1971 (J. G. H. Londt) 2 ♂♂, 28.xii.1971—3.i.1972 (F. W. Gess—Malaise Trap) ♀; Grahamstown, Bible Monument, 6.ii.1969 (F. W. Gess) ♀; Grahamstown, Clifton, 26.x.1972 (F. W. and S. K. Gess) 2 ♂♂, 27.x.1972 (F. W. and S. K. Gess) ♀, 7.xi.1972 (F. W. and S. K. Gess) 3 ♂♂, 9.xi.1972 (F. W. and S. K. Gess) ♂; Grahamstown, Cradock Dam, 29.xi.1964 (C. Jacot-Guillarmod) 12 ♀♀, 13 ♂♂; Grahamstown, Hilton, 19.xi.1969 (F. W. Gess) 2 ♀♀, 4 ♂♂, 12—30.xi.1970, ♀, 4 ♂♂, 1—4.xii.1970, 2 ♂♂, 1—18.xii.1970, ♀, 3 ♂♂, 19—31.xii.1970, 2 ♂♂ (all F. W. Gess—Malaise Trap); Grahamstown, Strowan, 26.xii.1967 (C. Jacot-Guillarmod) 10 ♀♀, 3 ♂♂, 7.i.1968 (C. Jacot-Guillarmod) ♀, 27.xi.1968, 26 ♀♀, 37 ♂♂, 9.xii.1968, 3 ♀♀, ♂, 11.xii.1968, 11 ♀♀, 8 ♂♂, 8.i.1969, 13 ♀♀, ♂, 16.i.1969, 4 ♀♀, ♂, 22.i.1969, 2 ♀♀, 4 ♂♂, 6.ii.1969, 3 ♀♀, ♂, 18.ii.1969, 2 ♀♀, 12.xi.1969, 11 ♂♂, 22.xii.1969, ♀, ♂, 30.xi.1970, 3 ♀♀, 7 ♂♂ (all F. W. Gess), 20.xii.1970 (C. Jacot-Guillarmod) ♂, 19.xii.1971 (F. W. Gess) 6 ♀♀, 2 ♂♂.

Orange Free State: Kroonstad, 26.xii.1964, ♀, 5.i.1965, 2 ♀♀, ♂, 27.xi.1965, ♂ (all D. J. Brothers).

Ceramius socius Turner
Cape Province: 48 miles E of Barrydale, 13.xi.1966, ♀; 27 miles E of Montagu, 13.xi.1966, 3 ♀♀; 13 miles SW of Touwsrivier, 11.xi.1966, ♀; 18 miles SE of Touwsrivier, 12.xi.1966, 2 ♀♀; 5 miles NE of Worcester, 11.xi.1966, ♂ (all J. G. Rozen); 10 miles SW of Touwsrivier, 8.xi.1968 (J. G. Rozen and E. Martinez) 5 ♂♂.

TABLE LISTING FLOWERS VISITED BY *CERAMIUS* SPECIES IN SOUTH AFRICA

Wasp species	Plant species and family	Locality	Date	Authority and reference
beyeri Brauns	*Mesembryanthemum aitonis* Jacq. (white flowers) MESEMBRYANTHEMACEAE	Bible Monument, Grahamstown	16.i.1969	F. W. Gess
bicolor (Thunberg)	"Mesems" (whitish flowers) MESEMBRYANTHEMACEAE	Die Bos Rd. (30 m. E of Clanwilliam	19.ix.1966	C. D. Michener (Gess, 1968: 13)
	Psilocaulon acutisepalum (Berger) N.E. Br. (pink flowers) MESEMBRYANTHEMACEAE	Olifants River between Klawer and Clanwilliam	14—15.x. 1967	F. W. and W. H. R. Gess (Gess, 1968: 13)
capicola Brauns	*Aridaria plenifolia* (N.E. Br.) Stearn (cream flowers) MESEMBRYANTHEMACEAE	New Year's Dam, Alicedale	2.xii.1970	F. W. Gess and J. G. H. Londt
	Mesembryanthemum aitonis Jacq. (white flowers) MESEMBRYANTHEMACEAE	Bible Monument, Grahamstown	6.ii.1969	F. W. Gess
	Mestoklema tuberosum (L.) N.E. Br. (pinkish-purple flowers) MESEMBRYANTHEMACEAE	Strowan, Grahamstown	6.ii.1969 18.ii.1969	F. W. Gess F. W. Gess
	Ruschia sp. (white flowers) MESEMBRYANTHEMACEAE	Strowan, Grahamstown	27.xi.1968 9.xii.1968 11.xii.1968 8.i.1969 16.i.1969 12.xi.1969 22.xii.1969 30.xi.1970 19.xii.1971	F. W. Gess F. W. Gess F. W. Gess F. W. Gess F. W. Gess F. W. Gess F. W. Gess F. W. Gess F. W. Gess
		Belmont Valley, Grahamstown	4.xii.1969	J. G. H. Londt
	Ruschia sp. (purple flowers) MESEMBRYANTHEMACEAE	New Year's Dam, Alicedale	2.xii.1970	J. G. H. Londt
	Berkheya sp. (yellow flowers) COMPOSITAE	Thaba Nchu	1.xii.1952	C. Jacot-Guillarmod (Richards, 1962: 117)
cerceriformis de Saussure (= *schulthessi* Brauns)	*Mesembryanthemum* sp. (*senso lato*) (purple flowers) MESEMBRYANTHEMACEAE	6 miles S. of Garies	7—8.x.1967	F. W. and W. H. R. Gess (Gess, 1968: 10)

(*continued*)

TABLE LISTING FLOWERS VISITED BY *CERAMIUS* SPECIES IN SOUTH AFRICA

Wasp species	Plant species and family	Locality	Date	Authority and reference
	Mesembryanthemum crystallinum (L.) N.E. Br. (white flowers) MESEMBRYANTHEMACEAE	Willowmore	31.x.1967	C. Jacot-Guillarmod
jacoti Richards	*Pteronia incana* DC (yellow flowers) COMPOSITAE	Brandrivier road, 2 miles from junction with Ladismith—Riversdale road	30.ix.1972	C. Jacot-Guillarmod
lichtensteinii (Klug)	*Aridaria* sp. (cream flowers) MESEMBRYANTHEMACEAE	Clifton, Grahamstown	7.xi.1972	F. W. and S. K. Gess
	Mesembryanthemum aitonis Jacq. (white flowers) MESEMBRYANTHEMACEAE	Bible Monument, Grahamstown	16.i.1969	F. W. Gess
	Ruschia sp. (white flowers) MESEMBRYANTHEMACEAE	Strowan, Grahamstown	11.xii.1968 8.i.1969 30.xi.1970	F. W. Gess F. W. Gess F. W. Gess
	Ruschia sp. (purple flowers) MESEMBRYANTHEMACEAE	New Year's Dam, Alicedale	2.xii.1970	F. W. Gess and J. G. H. Londt
linearis Klug	*Aridaria* sp. (cream flowers) MESEMBRYANTHEMACEAE	Clifton, Grahamstown	17.x.1972 26.x.1972 27.x.1972 7.xi.1972 9.xi.1972	F. W. and S. K. Gess F. W. and S. K. Gess F. W. and S. K. Gess F. W. and S. K. Gess F. W. and S. K. Gess
	Aridaria dyeri L. Bol. (cream flowers) MESEMBRYANTHEMACEAE	New Year's Dam, Alicedale	2.xii.1970	F. W. Gess
	Aridaria plenifolia (N.E. Br.) Stearn (cream flowers) MESEMBRYANTHEMACEAE	New Year's Dam, Alicedale	2.xii.1970 16.xii.1971	F. W. Gess and J. G. H. Londt F. W. Gess
	Malephora sp. probably *M. mollis* (Ait.) N.E. Br. (cream flowers) MESEMBRYANTHEMACEAE	Clifton, Grahamstown	26.x.1972	F. W. and S. K. Gess
	Mesembryanthemum aitonis Jacq. (white flowers) MESEMBRYANTHEMACEAE	Settlers' Dam, Grahamstown	30.xii.1971	F. W. Gess
	Ruschia sp. (purple flowers) MESEMBRYANTHEMACEAE	New Year's Dam, Alicedale	2.xii.1970	J. G. H. Londt
	Ruschia sp. (white flowers) MESEMBRYANTHEMACEAE	Belmont Valley, Grahamstown	5.xii.1969	J. G. H. Londt
toriger von Schulthess	"Blue-rayed Compositae" COMPOSITAE	Die Bos Rd. (30 miles E. of Clanwilliam)	19.ix.1966	C. D. Michener (Gess, 1968: 9)

Note: In the above table the generic names of the plants belonging to the Mesembryanthemaceae are those used by Herre (1971). This author is followed also with respect to the family name—thus in the present paper the name Mesembryanthemaceae is substituted for the name Aizoaceae used in previous papers (Gess, 1965 and 1968).

NESTING SITES AND NEST SUPERSTRUCTURES

Nesting sites of both *C. lichtensteinii* (Klug) and *C. capicola* Brauns occur at Strowan, about two miles north-west of Grahamstown. The sites favoured for nesting are open, bare patches of hard clay soil situated in low scrub including various low-growing Mesembryanthemaceae such as species of *Ruschia* and *Mestoklema*. The nesting sites are thus located in close proximity to the plants whose flowers are visited by the wasps for the dual purpose of obtaining their own nourishment and collecting the pollen and nectar utilised by the females in provisioning their young. The same close proximity of nesting sites to forage plants was observed in the same two species at Alicedale and also in *C. bicolor* (Thunberg) at the Olifants River between Klawer and Clanwilliam. In all cases the nesting sites were found to be situated not far from water; at Alicedale only a few feet away from the edge of a large reservoir, at Olifants River less than one hundred yards from a small stream and at Strowan somewhat further than that from a farm dam. The need for water in nest construction has been indicated by Brauns (1910:446).

In *C. capicola*, which nests in populous colonies, nesting appears to take place at the same site year after year, providing the area has not been disturbed. In this species males appear in numbers shortly before the females and are present at the nesting site for most of the flight period of the latter, becoming scarcer as the season advances.

Some time after the females have commenced excavating their burrows in the soil, entrance tubes or chimneys are built surmounting the mouths of the latter. These chimneys appear to be fairly characteristic for each species. The inside diameter of the chimney is determined largely by the size of the wasp which builds it. The bore of the chimney built by *capicola* is thus much narrower (about 4 mm) than that built by *lichtensteinii* (about 7 mm). An aspect of the architecture which is not dictated by the build of the wasp, however, is the orientation of the chimney relative to the ground.

It has been noted for *bicolor* (Thunberg) by Brauns (1910:387) (under the name *karooensis* Brauns) and by Gess (1968:13 and Pl. 1) that the chimney does not project freely into the air but is applied to the ground and is thus incomplete as the underside is formed by the ground itself.

The chimney built by *capicola* at Strowan is always free of the ground and has a complete underside (Plate 1). While the base of the chimney may vary from almost vertical to strongly slanting, various degrees of curvature of the structure as a whole serve to bring the opening at its end close to the ground to one side of the mouth of the burrow. The more nearly vertical the chimney is initially, the stronger the curvature. The wasp when returning to the nest alights on the ground in front of the opening, steps up and walks into and down the length of the chimney. This description does not agree with that given by Brauns (l.c.) according to which the chimney of *capicola* is of the same pattern as that of *bicolor* described above. It is however possible that that pattern may be produced when a chimney begins at an extreme slant but this has not been seen at Strowan.

The chimney built by *lichtensteinii* at Strowan is, as previously described by Brauns (1910:445), complete and free of the ground, straight or only very slightly curved, and projects more or less vertically upwards (Plate 2). The opening at its end is thus more or less above the mouth of the burrow. Activity at a single nest may extend over several weeks and a chimney may be replaced if broken. At Strowan a burrow without a chimney located on 11.xii.1968 had by 8.i.1969 when next examined been fitted with one; this chimney was then removed but had been replaced by 16.i.1969 when again examined. The chimney of a second burrow removed on 8.i.1969 had been replaced by 22.i.1969 when re-examined. At Strowan *lichtensteinii* was found to nest singly rather than in colonies. One burrow and chimney of this species was found in the middle of a populous colony of *capicola*.

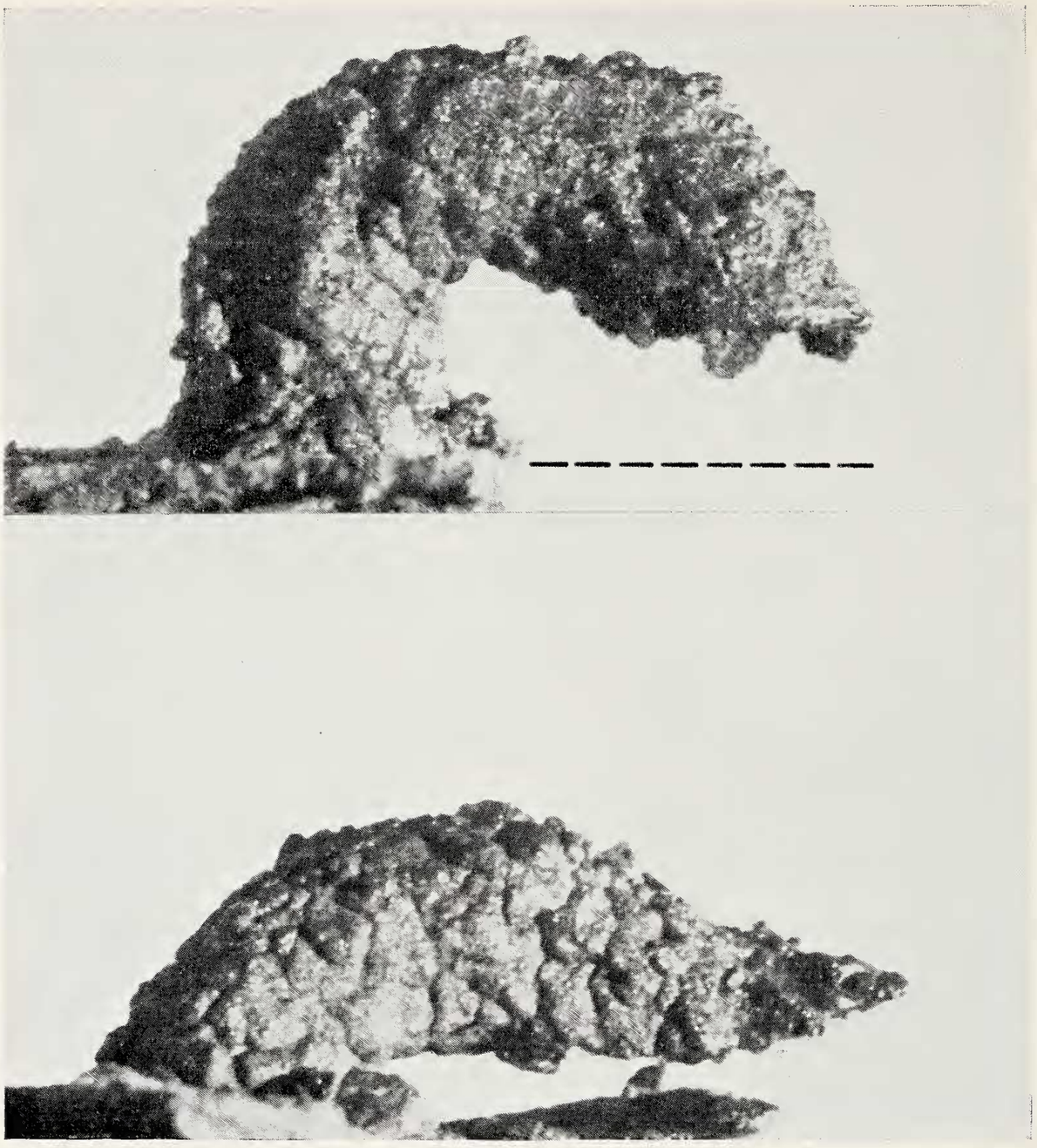


Plate 1. *Ceramius capicola* Brauns, nest superstructures (× 5,4) in lateral view. (The dashed line indicates the position of the surface of the ground.)

PARASITES

Allocoelia capensis Smith (Chrysididae) was recorded by Brauns (1910:446) as a parasite of *C. lichtensteinii* (Klug) in whose cells it develops. While this species has not been met with in the field, a related species, *Allocoelia latinota* Edney, has on several occasions been observed and caught at the nesting sites of *C. capicola* Brauns. Thus it was found associated with *capicola* Brauns by Jacot-Guillarmod at Grahamstown (Cradock Dam) on 29.xi.1964 and by the author at Grahamstown (Strowan) on 27.xi.1968, 9.xii.1968, 11.xii.1968 and 30.xi.1970. Londt while collecting *Ceramius* species (*lichtensteinii*, *linearis* and *capicola*) at Alicedale (New Year's Dam) on 2.xii.1970 obtained a specimen of the parasite while a further specimen

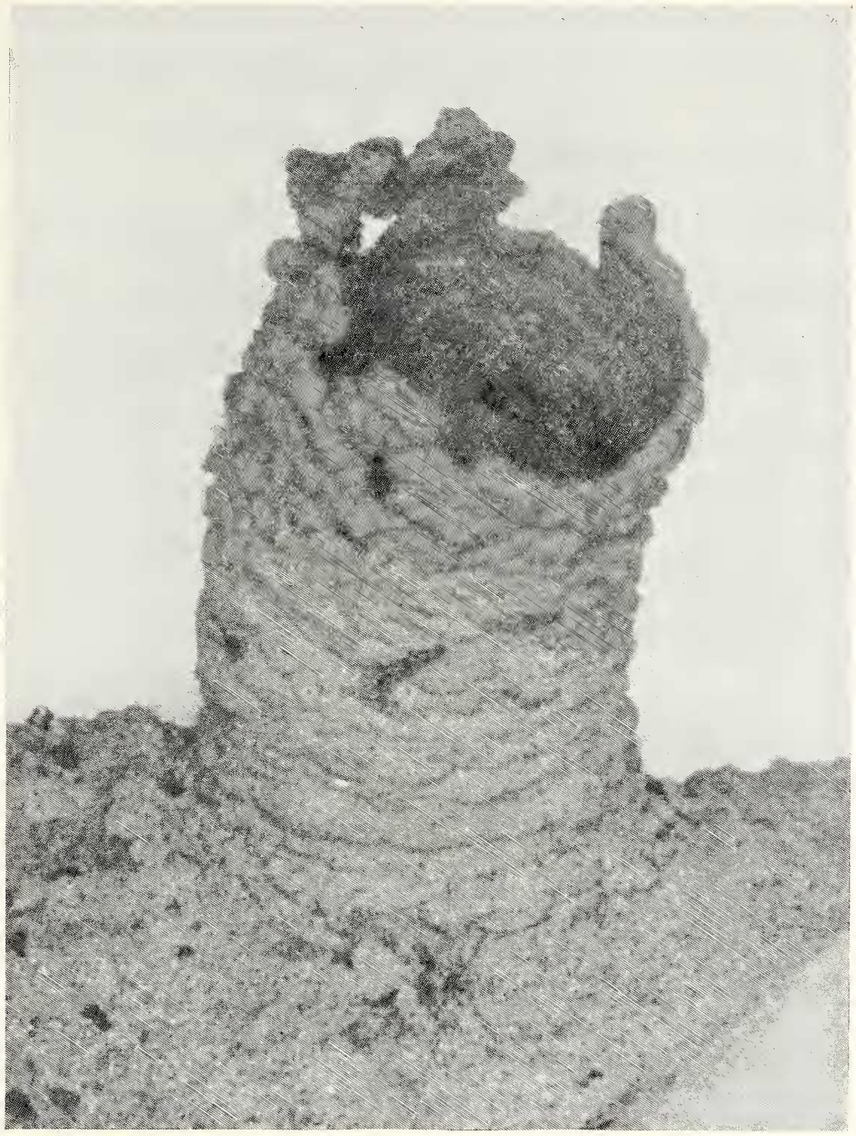


Plate 2. *Ceramius lichtensteinii* (Klug), nest superstructure (× 5).

was caught by Malaise Trap at Kenton-on-Sea in the period 1—8.xii.1970. As only *linearis* Klug has been recorded from the latter locality it would seem likely that this species is also host to *A. latinota* Edney.

In the description of *A. latinota*, Edney (1947:199) states that the pronotum is pale ferruginous. The present series of thirteen specimens shows that within a single population the pronotum of various individuals may vary from almost completely pale ferruginous, through various intermediate conditions, to totally black.

KEY TO THE SOUTH AFRICAN SPECIES OF *CERAMIUS* LATREILLE

Since the publication of Richards' account of the Masaridae (1962) papers by Gess (1965, 1968 and present paper) dealing with the South African species of the genus *Ceramius* have included the following changes and additions:

1. The sinking of *schulthessi* Brauns into synonymy with *cerceriformis* de Saussure. (present paper)

2. The raising out of possible synonymy with *lichtensteinii* (Klug) of *rex* de Saussure (1965) and the description of the previously unknown male. (present paper)
3. The removal from *peringueyi* Brauns of a male assigned to that species by Richards and the inclusion of this male together with a previously undescribed female in a new species, *richardsi* Gess (1965).
4. The description of both sexes of a new species, *micheneri* Gess (1968), of the previously unknown female of *clypeatus* Richards (1965), and the males of *metanotalis* Richards (1965) and *toriger* von Schulthess (1968).

At present nineteen South African species are recognised, of which only *peringueyi*, whose male has still to be collected, is not known in both sexes.

The following key to species based on that published by Richards is an attempt to provide a simplified version applying only to the South African (in fact Ethiopian) species but incorporating the above changes and additions.

1. Mid tibia with one spur 2
— Mid tibia with two spurs 8
2. Propodeum rounded. . . . . *bicolor* (Thunb.)
— Propodeum with dorsal angles produced into strong spines 3
3. Males 4
— Females 6
4. Fore trochanter with parallel-sided process, truncate at end . . . . *linearis* Klug
— Fore trochanter with spatulate process 5
5. Antennal segment 12 with apex narrowly black, somewhat thick, apex truncate *socius* Turner
— Antennal segment 12 entirely pale, thinner, narrowed to apex . . *capicola* Brauns
6. Sparsely punctured part of frons spreading more upwards and sidewards, area between ocelli and eyes shining and clearly less closely punctured than adjacent parts *socius* Turner
— Sparsely punctured part of frons not spreading so much upwards and sideways, area between ocelli and eyes rarely with wide smooth interstices 7
7. Larger; first gastral tergite longer, not so transverse (less than twice as wide as long). Propodeal spines larger . . . . . *linearis* Klug
— Smaller; first gastral tergite shorter, strongly transverse (more than twice as wide as long). Propodeal spines smaller . . . . . *capicola* Brauns
8. Sides of metanotum with an acarinarium produced by the growth of the front margin over the usual lateral depression, leaving a small entrance on each side 9
— Lateral depressions of metanotum uncovered or at most partly filled in 11
9. Entrance to acarinarium narrow throughout, slit-like, clearly narrower than part of metanotum in front of it . . . . . *metanotalis* Richards
— Entrance to acarinarium wide at least laterally, of about same width as part of metanotum in front of it 10
10. Entrance to acarinarium about twice longer than wide, widening laterally. Male with preapical lateral keels on sternite 4 . . . . . *caffer* de Saussure
— Entrance to acarinarium about four times longer than wide, width nearly constant throughout, only slightly wider laterally. Male without preapical lateral keels on sternite 4 . . . . . *rex* de Saussure
11. Gastral sternite 1 ventrally truncate posteriorly, tergite 1 somewhat scale-like, very transverse, narrower dorsally than ventrally, deeply separated from 2. Propodeum always rounded 12

— Gastral sternite 1 almost flat, not truncate, tergite 1 not scale-like, not deeply separated from 2. Propodeum variable 14
12. Propodeal spiracle large and oval. Eyes strongly emarginate. Clypeus with strong lateral wings . . . . . *lichtensteinii* (Klug)
— Propodeal spiracle narrow as usual. Eyes weakly emarginate. Clypeus without lateral wings 13
13. Claws toothed. Scutellum less margined, dorsal axillary sclerite more angular, almost spine-like. Prescutal furrow rather strong . . . . . *beyeri* Brauns
— Claws untoothed. Scutellar disk clearly margined, dorsal axillary sclerite less angular. Prescutal furrows weak . . . . . *damarinus* Turner
14. Propodeum with spine-like processes or at least with very blunt angular projections 15
— Propodeum rounded 19
15. Clypeus of both sexes unmodified. Male with strong processes on sternites 3, 7 and 8 16
— Clypeus of both sexes much modified, with apical teeth. Male with sternite 3 simple 18
16. Males (this sex not known in *peringueyi* Brauns) . . . . . *cerceriformis* Sauss. OR *peringueyi* Brauns
— Females 17
17. Clypeus shorter, one and one-third times as long as scape, ventral margin straight, angles more marked. Depression in axilla deeper, defined outwardly by a strong keel *peringueyi* Brauns
— Clypeus longer, one and two-third times as long as scape, ventral margin a little rounded. Depression in axilla much shallower, not so closely defined outwardly by a keel . . . . . *cerceriformis* Sauss.
18. Clypeus strongly raised, then bent at right angles, with two small curved diverging teeth just below the bend . . . . . *richardsi* Gess
— Clypeus elongate, disc somewhat longitudinally impressed, apex with four small upturned teeth . . . . . *clypeatus* Richards
19. Clypeus almost quadrate, very slightly shorter at midline than wide at ventral margin, its sides slightly divergent distally. Male antennae narrowed towards apex and bent in a half spiral; parameres straight and spiniform; process of fore-trochanter wide, flattened and parallel-sided . . . . . *micheneri* Gess
— Clypeus considerably longer at midline than wide at ventral margin, its sides clearly convergent distally. Male antennae with last segment excavate beneath forming a sometimes strong hook; parameres stout, hardly spiniform; process of fore-trochanter either racket-shaped or with tip produced into a curved projection, or recurved . . 20
20. Males 21
— Females 24
21 Antennae with segment 12 much shorter and narrower than 11, barely hook-like. Fore trochanter with process racket-shaped . . . . . *braunsi* Turner
— Antennae with segment 12 proximally as wide as 11 but almost at once strongly narrower, forming a strong, curved, flattened hook longer than 11. Fore trochanter with process parallel sided, tip narrower and curved or recurved and hook-like . . 22
22. Gaster with sternite 3 with a low bituberculate prominence. Tergite 7 with sides converging, apex rounded laterally and narrowly emarginate in middle and thus appearing bilobed . . . . . *nigripennis* Sauss.
— Gaster with sternite 3 with differently formed prominence. Tergite 7 flattened, with sides subparallel or even slightly divergent distally, apically truncate or subtruncate with distinct lateral angles 23
23. Prominence of gastral sternite 3 wide, transverse, lamellate distally, backwardly directed . . . . . *jacoti* Richards

— Prominence of gastral sternite 3 narrow, transverse, flanked anterior-laterally at each end by a tubercle and posteriorly by a raised platform . . . . *toriger* Schulthess

24. Gaster dull, not perceptibly punctured . . . . . *nigripennis* Sauss.

— Gaster shining, finely punctured 25

25. Tergite 6 subtruncate, with a marked transverse impression . . . *toriger* Schulthess

— Tergite 6 rounded, not transversely impressed 26

26. Sternite 6 flat, with a distinct angular emargination at apex. Scutellum not margined (disc and sides therefore meeting in a curve), with a weak longitudinal prominence *braunsi* Turner

— Sternite 6 raised at apex, without a distinct angular emargination. Scutellum crenulately margined (disc and sides therefore meeting at an angle), with a well marked longitudinal prominence on posterior half . . . . . *jacoti* Richards

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